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The Index of Sustainable Economic Welfare revisited for Poland in transition.

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Summary

In the paper, the Index of Sustainable Economic Welfare (ISEW) for Poland was calculated. The research covers the time period between 1990 and 2003. The lowest values of ISEW were observed in 1990, when Poland still experienced the economic crisis. Up to 1992, we can observe a dynamic growth then slowing down and progressing again in succeeding years, which eventually shows back a new and more moderate tendency started in 2000. It seems, that the stagnation effect in ISEW can be attributed, in order of potential, to categories like: losses caused by commuting and road accidents, long-term environmental damage, expenditures on consumer durables, losses due to ozone layer depletion, change in net international position, depletion of non-renewable resources. Moreover, growing welfare inequalities penalize the value of ISEW in recent years much more significantly than before.

Keywords: sustainable development, sustainability, welfare, indicators, Poland

1 Methodology applied

The index for Poland was calculated on the basis of information on hitherto calculations of the Index of Sustainable Economic Welfare (ISEW) for other countries, particularly for the United States of America (Daly, Cobb, 1989), Scotland (Moffatt, Wilson, 1994), Sweden (Jackson, Stymne, 1996) and Austria (Stockhammer *et al*., 1997]. The structure of data presentation proposed by the authors of the first ISEW calculus, i.e. Daly and Cobb, was employed and some of the critics and modifications to methods of calculation introduced by followers were taken into account.

ISEW has been developed out of the concern that Gross Domestic Product (GDP) is not an adequate indicator for either current welfare or the achievement of sustainability defined as the capacity to provide non-declining future welfare. The main critiques have been that GDP is misleading because it does not take the value of household labour, the welfare effects of income inequality, and the welfare loss due to environmental degradation into account. Additionally, GDP considers "defensive expenditures" (to large extent costs of recovery and restitution of original environmental quality, state of health, etc.) wrongly as contributions to welfare.

The idea of ISEW was supposed to provide a remedy for these shortcomings in order to provide a more reliable monetary indicator of welfare and sustainability. The authors of ISEW wanted to compromise economic, environmental and social aspects of sustainable welfare. The environmental part exists in the index represented by the costs associated with the present pollution and long-term environmental damage. The most obvious economic components of ISEW are consumption and capital growth. Distribution of income has been adopted as the direct representation of a social aspect of welfare.

There is a lot of positive opinions and statements on ISEW, Genuine Progress Indicator (GPI) and related indexes. They demonstrate that these alternatives to GDP are theoretically sound but, in order to be broadly accepted, require the continuous development of more robust valuation methods (Lawn, 2003). And all this because values of some items are still likely to be, at best, distant approximations of their correct value. Moreover, there is also a genuine need for a standardized set of items and valuation techniques to allow for a more meaningful welfare comparison of different nations.

On the other hand, there are also researchers who agree that ISEW is not perfect in too many aspects. One of the most damaging critiques on ISEW (Neumayer, 1999) suggests that ISEW lacks firm theoretical foundations of economic character. The weakest elements are: arbitrarily assessed and accumulated costs of long-term environmental damage, arbitrarily defined scope and interpretation of defensive expenditures, simplified assumption that a more equal society is more apt to secure non-declining future welfare. Some elements like net profits from education or technical advances are not considered at all.

It may be critically concluded that with different assumptions about weighting of income

distribution, the corrections for the depletion of non-renewable resources and long-term environmental damage, and the inclusion of the positive effects of human capital formation and technical progress, one will get a different picture of a society's welfare and achievement of sustainability. However, in our opinion, it is an argument to look for a reasonable improvement in ISEW and other similar indicators instead of saying that macroeconomic, single-number sustainability indicators are useless.

All Polish ISEW estimates, which were officially published, accepted the same original and basic assumptions (Daly, Cobb, 1989). From the very beginning we agreed to modify slightly the original concept after the most reliable British, Swedish and Austrian studies (Moffatt, Wilson, 1994; Jackson, Stymne, 1996; Stockhammer *et al*., 1997). The most important improvement in domestic valuation was the data source for air and water pollution costs assessment. For the first time, they were assessed based on environmental protection expenditures while presently they are calculated taking into account real pollution data combined with an estimated average monetary cost per unit of each pollution in question.

In this study, the most significant modification when compared to the original ISEW is the method of weighting of ISEW. Weighting by the inequality coefficient has been applied to the entire value of the index after Austrians (Stockhammer *et al*., 1997) and not to the individual consumption only as Daly and Cobb (1989) did. It has been argued that in a society with a significant income distribution inequalities not only individual income but also other categories which are important for welfare and sustainability are strongly influenced by inequality consequences. In this context inequality coefficient works as a penalty to the total value of ISEW.

Finally, elaborating collected external and earlier Polish experiences (Sleszynski, 2000; Gil, Sleszynski, 2003; Prochowicz, 2003), the following assumptions were adopted in this study:

- Respective components of the sustainable economic welfare index were calculated for the represented time period in current prices, and then reflected in constant prices in a configuration of columns corresponding to them traditionally as in Daly's and Cobb's work.
- It was pretended to present the components of the index in a form of streams, and where possible, to apply the same method to calculations of subtracted categories, adequately to requirements toward an ISEW formulated and calculated by the authors of an Austrian paper.
- The following categories and traditionally corresponding columns were included (in brackets there are positive or negative signs reflecting influence of a given category on welfare):

Column A	Year;	
Column B	(+)	Consumer expenditures (personal consumption);
Column C	(+)	Services from domestic labor;
Column D	(+)	Services from consumer durables;

Column E	(+)	Services from streets and highways;
Column F	(+)	Public health and education expenditures;
Column G	(-)	Consumer durables expenditures;
Column H	(-)	Defensive private expenditures on education and health;
Column I	(-)	Cost of commuting;
Column J	(-)	Cost of automobile accidents;
Column K	(-)	Cost of water pollution;
Column L	(-)	Cost of air pollution;
Column M	(-)	Cost of noise pollution;
Column N	(-)	Loss of wetland;
Column O	(-)	Loss of farmland;
Column P	(-)	Depletion of non-renewable resources;
Column Q	(-)	Cost of long-term environmental damage;
Column R	(-)	Cost of ozone layer depletion;
Column S	(+/-)	Net capital growth;
Column T	(+/-)	Net change in international position;
Column U	(+/-)	Distributional inequality.

  - Selection of ISEW categories presented above does not introduce any new components of the index. Categories for computations were chosen from the list of categories introduced in previous studies with regard to their importance for the welfare level in reality of Polish economy.
  - Taking into account the comments on the ISEW studies for Austria, a distribution of income inequality (as weighting the original consumption value) was not applied exclusively to the consumption expenditures only but to the total ISEW value.
- Analogously to the authors of ISEW for Sweden, private costs of environmental protection and costs of urbanization were not taken into consideration, because so far they seemed to have a minor impact on welfare in a sense in which they were included in calculations of ISEW for the USA, England, and Austria.
- Whenever a need for gathering some missing data necessary to construct the complete time series occurred, the interpolation and linear extrapolation was used.
- Values of all ISEW categories were calculated in new Polish Zloty (PLN) in constant 1992

prices. The selection of this particular reference year due to some earlier ISEW calculations for Poland. To convert values expressed in current prices into constant prices a deflator has been used constructed on the basis of the GDP price index for the years 1990-2003.

- The research covers the time period between 1990 and 2003. The choice of this particular period was determined by availability of reasonably homogenous and fairly complete data. It has to be clearly indicated, however, that this transition period was typified by a considerable variability of the conditions of economic development, what additionally complicates the analysis of the processes of growth or falls of welfare. Original ISEW was built up with the intention to analyze the long-term trends in a stabilized market economy.

Before the studied period 1990-2003, the epochal and unique events took place in Poland: crisis of the 1980s, transition from centrally planned economy to free-market-based economy accompanied by a decrease in production of majority of enterprises on the turn of the 1980s and 1990s, and, beginning in 1992, an economic growth reflected in an increase of gross domestic product in constant prices. The present situation depends upon those facts. Moreover, it is hardly possible to draw the conclusions related to both periods – before and after deep transitions of the system.

2 Index of Sustainable Economic Welfare – estimates for Poland

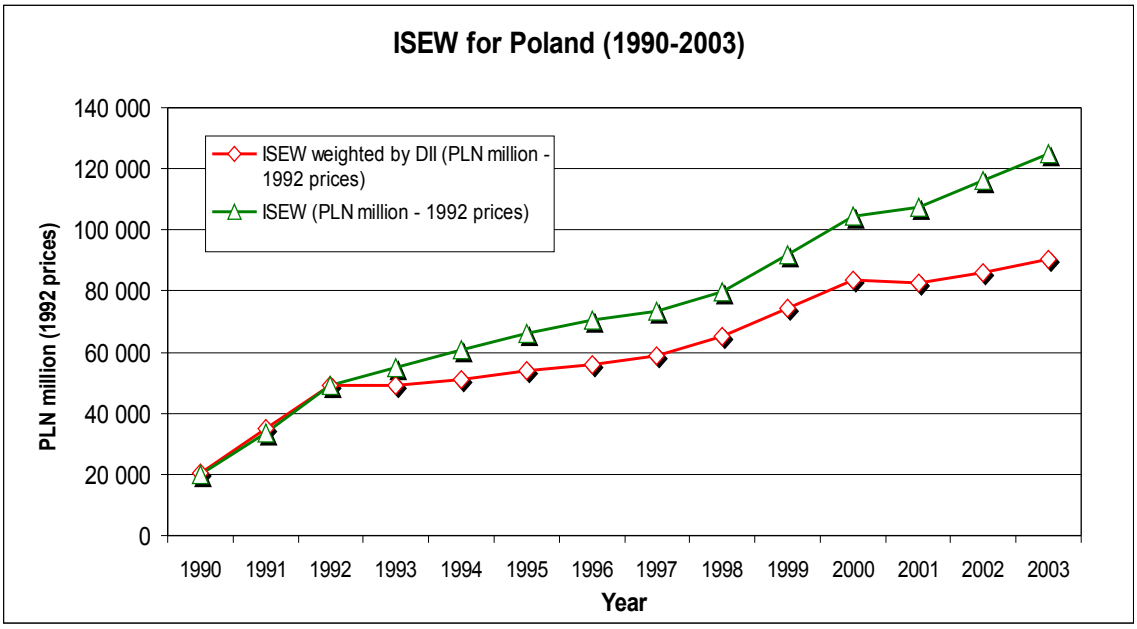
The sustainable economic welfare index (ISEW) was computed by adding values of categories that increase welfare and subtracting values of categories that decrease welfare, and - depending on a sign, by adding or subtracting values of categories that alter the welfare by net value (Table 1). In this way a result was reached – an unweighted ISEW. In order to receive original ISEW, results for each year were adjusted (weighted) by distributional inequality index (DII).

Growing stratification in welfare of the society in the 90s is clearly reflected on the graph (Figure 1). Different course of ISEW curve results from a change in personal income stratification compared in relation to its position in 2003. This trend, initiated after 1992, resulted in a growing gap between ISEW and weighted ISEW, especially in the period 2000-2003. An effect obtained in result of weighting ISEW by a welfare inequality index indicates a need to restrain from the optimism that accompanies the observations of growing various economic indicators which do not take into account an individual welfare of citizens.

When considering sensitivity to changes in individual welfare, *per capita* indexes gain a special importance. Figure 2 shows ISEW *per capita* curve in the analyzed period. Comparing it with ISEW trend one can notice how the adjustment for population growth contributes to a decline in dynamics of the welfare curve.

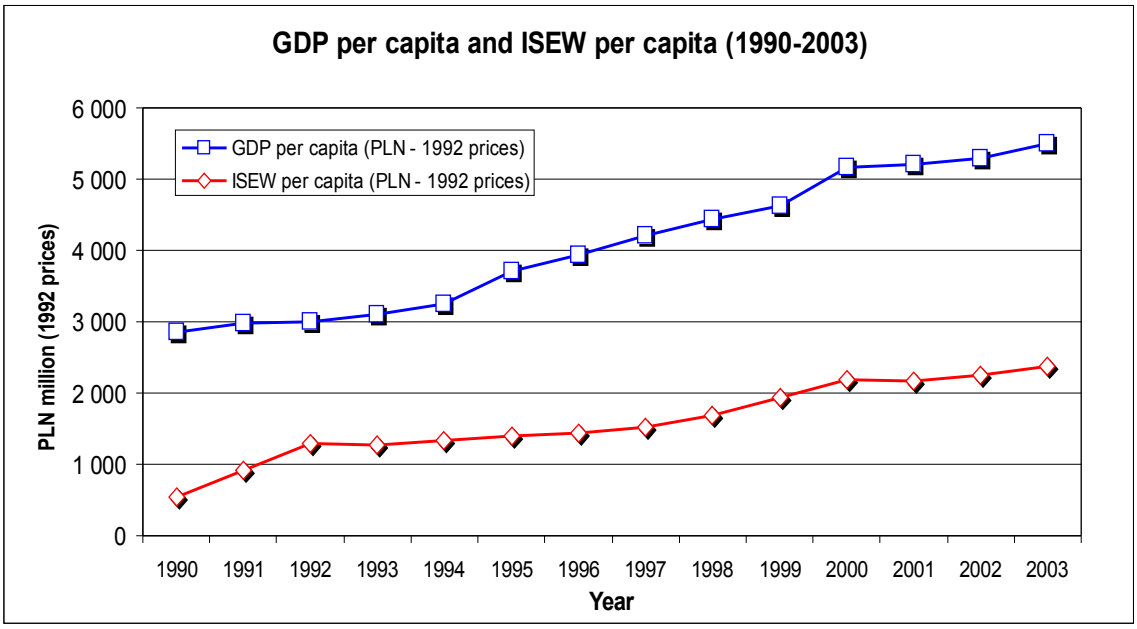
Figure 2 presents also ISEW *per capita* together with GDP *per capita* in 1990-2003. Comparing ISEW with GDP trend one can notice that despite introduction of a factor that adjusts for population growth into both indexes, they still show a clear divergence in dynamics. In years when a growth of GDP *per capita* can be observed, ISEW *per capita* usually grows less

significantly. Whenever ISEW *per capita* grows, GDP *per capita* remains stable.



Source: Prochowicz, Sleszynski, 2005

Figure 1. ISEW and impact of distributional inequality index (DII) on ISEW

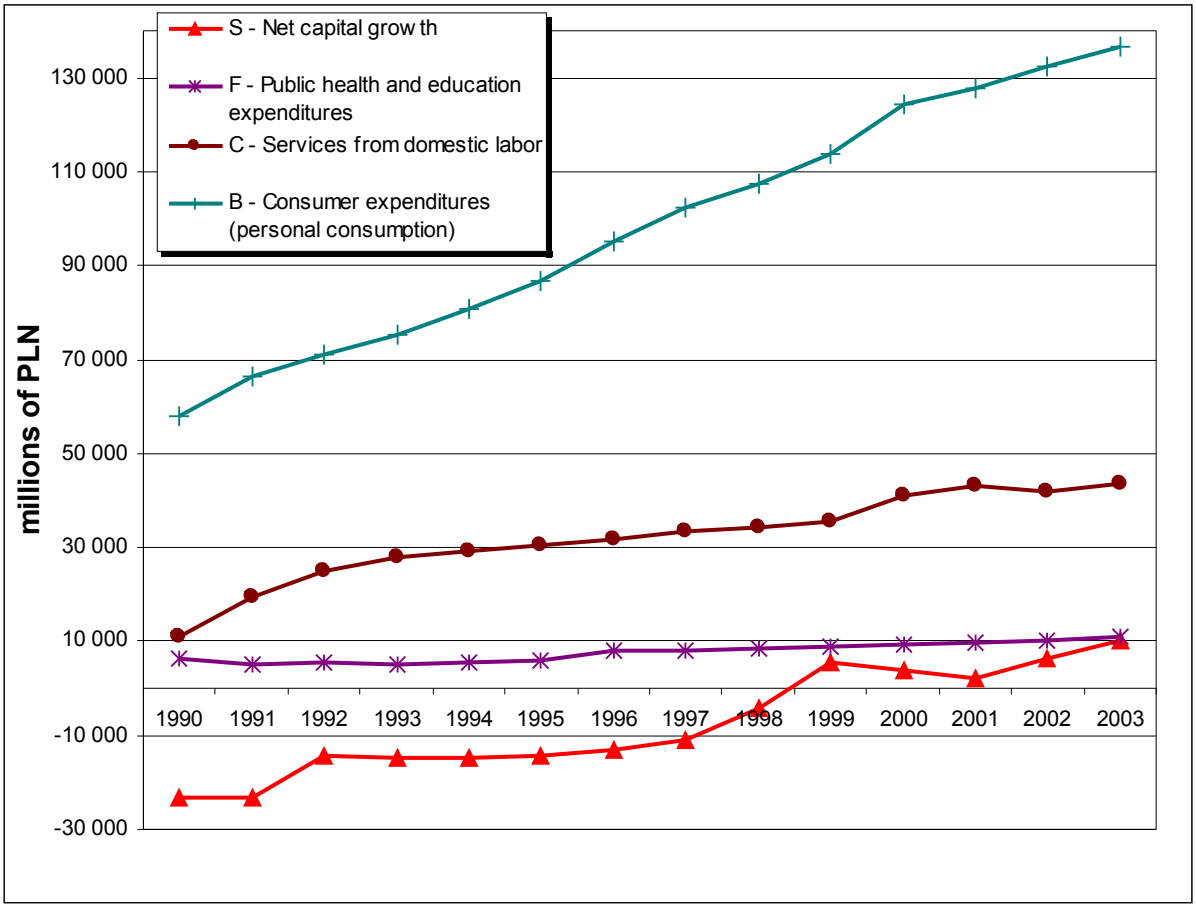


Source: Prochowicz, Sleszynski, 2005

Figure 2. Comparison of GDP and ISEW trends

Only in 2000-2003 both indexes run in a more parallel way. It seems, thus, that these four years were the only in the last decade when a dynamics of measured welfare was accompanied by a similar dynamics of the economy. GDP growth in 1990-2003 can not be, thus, considered as surely sustainable as far as we accept a definition of the sustainable welfare in the way it was explained in the seminal book of Daly and Cobb (1989).

Sustainable economic welfare calculated in accordance with the previously described method shows a clear upward tendency after the transformations of the system in 1990-1992. In 1997-2000 ISEW begins to increase dynamically again. The index grows rather slowly in the remaining years of the analyzed period. Analytical research needs to address the question which categories participated in the upward and downward tendencies of the index.



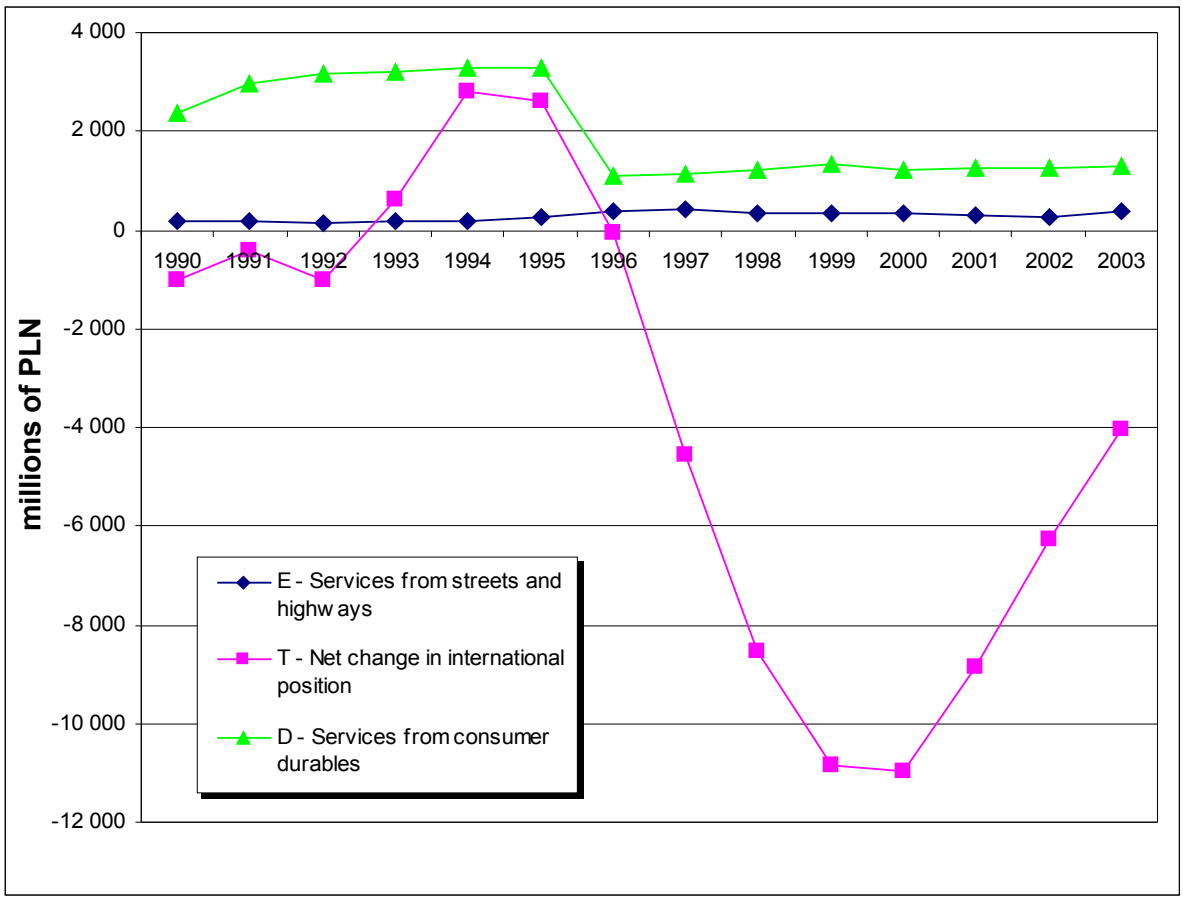
Source: Prochowicz, Sleszynski, 2005

Figure 3. Categories most significant for the growth of ISEW

The most extensive component of ISEW is individual consumption (B) which is primarily responsible for the shape of the index curve (Figure 3). Characteristic points in consumption are simultaneously reflected in the shape of the ISEW curve. Services from domestic labor (C) is the second factor determining the value of ISEW. Public expenditures on health and education (F)

and net capital growth (S) – but positive only after 1998 (!), can be considered as two next categories which values supported the positive result of ISEW, especially in recent years.

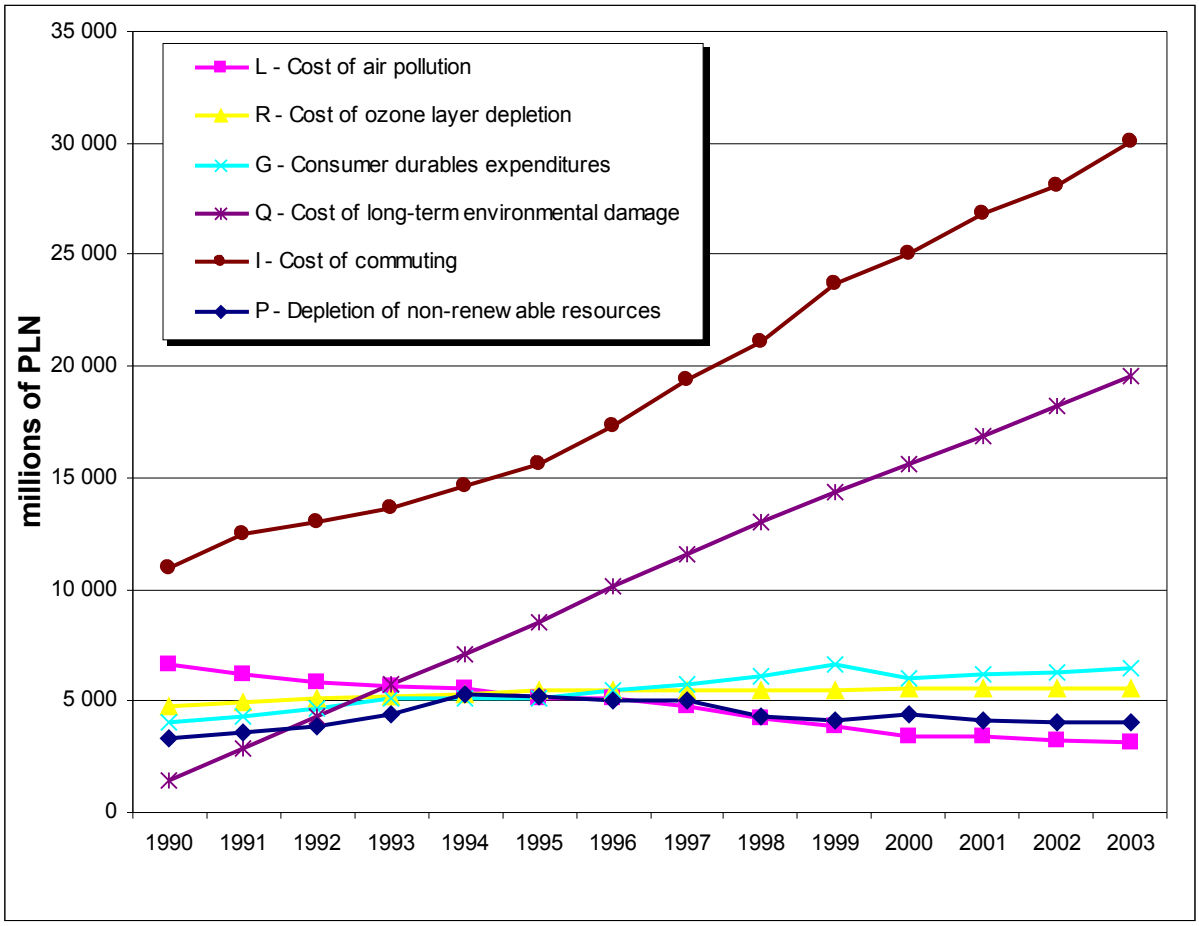
The remaining positive elements of total ISEW like services from streets and highways (S) and services from consumer durables (D) are of rather small and stable volume between 1990 and 2005. However, since 1996, net change in international position of Poland (T) contributes to ISEW with a negative value what was observed also before 1993 and should be an alarming signal for the trade and foreign investment policy.



Source: Prochowicz, Sleszynski, 2005

Figure 4. Categories less significant for the growth of ISEW

The categories that most negatively influence welfare have certainly contributed with their potential volume to it (Figures 5). In particular, those that included cost of commuting (I), cumulated long-term environmental damage" (Q), consumer expenditures on durable goods (G), cost caused by ozone layer depletion (R), cost of air pollution (L), and depletion of non-renewable resources (P). Exactly, two first categories contributed most substantially to the total value of ISEW while next four remained on the lower level and stable in the entire period.

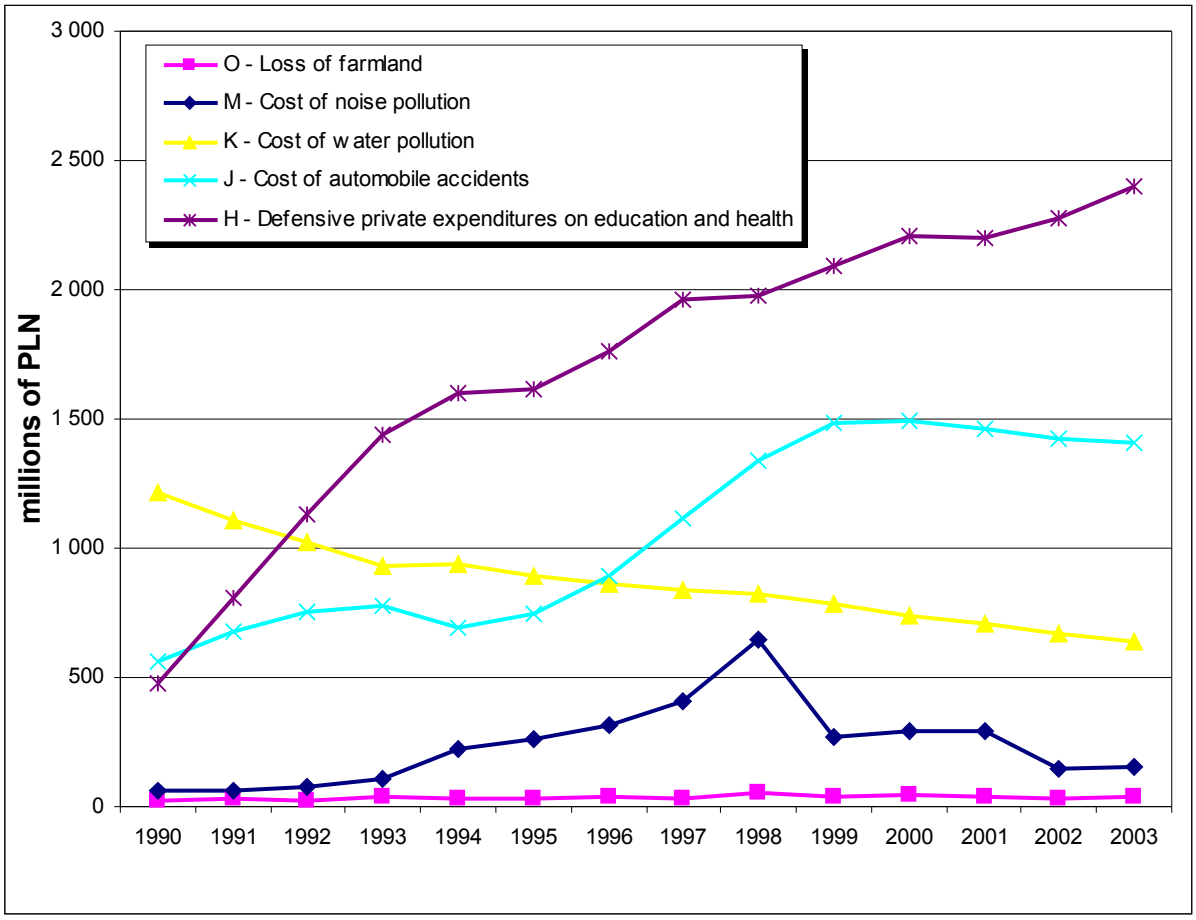


Source: Prochowicz, Sleszynski, 2005

Figure 5. Categories most significant for the decline of ISEW

The dynamics of categories with much less potential to influence negatively the value of ISEW is very much differentiated (Figure 6). Defensive private expenditures on health and education (H) grow very quickly all the time while cost of automobile accidents (J) slowed down after rapid growth until 1998. The remaining categories which are negative in the summation do not diminish much the value of ISEW.

Categories like net capital growth (S) and change in net international position (column T) turned out to be somehow special. These categories as being positive in some years and negative in others contributed to significant irregularities of ISEW value. Strong fluctuations are result of deep and structural changes, so called shock therapy, in the domestic economic system. In particular, only the beginning of 90s was the period when the capital declined. On the other hand, international position of Poland before 1993 and especially in the period 1996-2003 contributed to ISEW in a very negative way.



Source: Prochowicz, Sleszynski, 2005

Figure 6. Categories less significant for the decline of ISEW

3 Conclusions

On the basis of a method employed by the authors of ISEW, and taking into account some selected modifications done in latter ISEW calculations for other countries, in this paper ISEW for Poland for years 1990-2003 has been assessed. Formation of the sustainable economic welfare in Poland is reflected in changes of index values in the analyzed period and in a shape of its curve. In particular, ISEW *per capita* weighted by distributional inequality index, indicates the sustainable welfare that incorporates welfare disparities in the society and population growth.

In result, it turned out that ISEW for Poland in 1990-2003 indicated a certain degree of volatility. The lowest values of ISEW were observed in 1990, when Poland still experienced the economic crisis. Up to 1992, we can observe a dynamic growth then slowing down and progressing again in years succeeding 1997, which eventually shows back a new and more moderate tendency started in 2000.

It seems, from the data analysis, that the stagnation effect in ISEW can be attributed, in order of

potential, to categories like: losses caused by commuting and road accidents, long-term environmental damage, expenditures on consumer durables, losses due to ozone layer depletion, change in net international position, depletion of non-renewable resources. Moreover, growing welfare inequalities penalize the value of ISEW in recent years much more significantly than before. When comparing ISEW *per capita* for Poland with GDP *per capita* for Poland in the analyzed period, an interesting interdependence can be observed. For the most years of the period, both indexes showed a slightly contradictory tendencies of growth and stagnation. Dynamic growth of GDP *per capita* was accompanied by the delicate growth of ISEW *per capita* and *vice versa*. Quite a simple conclusion may be drawn that, providing the assumption and the method of calculation of sustainable economic welfare index are correct, the commonly used measure of quality of the economy, i.e. gross domestic product, does not reflect well the economic welfare of citizens in terms of its sustainability.

Dynamics of the index proves the economic development after transformation to tend to be rather sustainable. Its insignificant growth observed in last four years covered by our study suggests to analyze more carefully a direction in which the economy of Poland is heading. It is very likely that an increase in GDP accompanied by almost stabilized ISEW is due to adoption of environmentally unfriendly production and consumption patterns. Maintaining the current course of the development in the future might lead to a society with strong income disparities, with more and more expansive consumption resulting from intensive depletion of natural resources, which would impose cost on future generations.

When observing the dynamics of ISEW *per capita* for Poland and other countries, someone may notice, surprisingly, that Poland does not participate in the overall downward tendency, which in more developed economies begun in the 1970s. This as a computational result of unsolved global problems concentrated around global warming and ozone layer depletion. In general, irregularities in ISEW curve for Poland in comparison with other countries are definitely produced by the short period under consideration (minor weight of GHG cumulative effect) but also by the specific process of political and economic transformation experienced by Poland.

However, in opposition to conclusions drawn typically by those who analyze traditional and positive economic indicators for Poland in 90s, ISEW estimates presented in this study call for a careful revision of some social and economic problems which still seem to be unsustainable in running national economy. A deep analysis of reasons of negative trends discussed above is needed to take control over these trends now and in the future.

A	o	Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
B	+	*Consumer expenditures (personal consumption)*	57 788	66 481	70 955	75 249	80 799	86 586	95 013	102 296	107 297	113 605	124 293	127 551	132 207	136 498
C	+	*Services from domestic labor*	10 945	19 537	24 946	28 085	29 369	30 397	31 731	33 330	34 445	35 712	41 246	42 978	42 041	43 452
D	+	*Services from consumer durables*	2 351	2 952	3 162	3 211	3 301	3 266	1 087	1 149	1 227	1 335	1 202	1 247	1 261	1 292
E	+	*Services from streets and highways*	166	168	144	167	195	265	381	402	352	354	341	300	276	364
F	+	*Public health and education expenditures*	6 552	5 099	5 327	5 202	5 620	5 977	7 879	8 249	8 431	9 016	9 482	9 928	10 131	11 047
G	-	*Consumer durables expenditures*	4 054	4 268	4 682	5 092	5 129	5 075	5 433	5 747	6 136	6 677	6 009	6 235	6 306	6 459
H	-	*Defensive private expenditures on education and health*	477	804	1 129	1 438	1 599	1 612	1 758	1 961	1 979	2 092	2 208	2 202	2 278	2 402
I	-	*Cost of commuting*	10 977	12 515	13 029	13 609	14 624	15 619	17 279	19 406	21 102	23 686	25 020	26 849	28 117	30 094
J	-	*Cost of automobile accidents*	560	678	754	778	689	746	893	1 118	1 335	1 488	1 494	1 458	1 423	1 407
K	-	*Cost of water pollution*	1 214	1 107	1 021	930	939	891	860	840	827	786	738	709	672	642
L	-	*Cost of air pollution*	6 653	6 219	5 851	5 685	5 554	5 113	5 137	4 788	4 188	3 853	3 389	3 440	3 251	3 132
M	-	*Cost of noise pollution*	62	63	74	110	225	259	318	409	647	269	290	295	147	153
N	-	*Loss of wetland*	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O	-	*Loss of farmland*	20	30	23	39	30	29	39	34	51	42	43	39	34	36
P	-	*Depletion of non-renewable resources*	3 331	3 601	3 871	4 384	5 307	5 180	5 011	5 045	4 298	4 107	4 385	4 172	4 027	4 079
Q	-	*Cost of long-term environmental damage*	1 445	2 860	4 268	5 725	7 110	8 541	10 100	11 590	12 997	14 336	15 624	16 915	18 254	19 587
R	-	*Cost of ozone layer depletion*	4 777	4 928	5 078	5 232	5 331	5 435	5 467	5 486	5 504	5 515	5 526	5 557	5 598	5 699
S	+	*Net capital growth*	-23 130	-23 311	-14 467	-14 678	-14 758	-14 408	-13 210	-10 954	-4 403	5 429	3 768	2 224	6 423	9 981
T	+	*Net change in international position*	-1 008	-409	-1 025	634	2 814	2 605	-46	-4 573	-8 548	-10 857	-10 950	-8 857	-6 263	-4 024
		ISEW before applying distributional inequality index	**20 095**	**33 442**	**49 263**	**54 852**	**60 803**	**66 188**	**70 539**	**73 475**	**79 738**	**91 744**	**104 657**	**107 499**	**115 967**	**124 919**
U	x	*Distributional inequality index*	98,1%	95,5%	100,0%	112,2%	119,1%	122,4%	126,3%	124,5%	122,8%	123,0%	124,9%	130,0%	134,8%	138,4%
		ISEW	**20 490**	**35 006**	**49 263**	**48 870**	**51 034**	**54 070**	**55 867**	**59 007**	**64 946**	**74 615**	**83 805**	**82 667**	**86 053**	**90 263**

Table 1. Index of Sustainable Economic Welfare 1990-2003 for Poland (PLN million, 1992 prices)

Annex

The Annex lists all ISEW items indicating these which need more careful consideration. Information on all details of ISEW calculation will be available in the published version of this paper. Messages below comment briefly the source of data plus the most recent and the most problematic aspects of estimates for each category under consideration. Next research step will take all these considerations into account.

Column A – Period

The study presents ISEW estimates for years 1990-2003. After 1990, the domestic data were more homogeneous and easier adaptable to the market based methodology. 2003 is the last year with satisfying set of required data.

Column B - Consumer expenditures (personal consumption)

Central Statistical Office (CSO) annual yearbooks, therefore, no problem with the data availability.

Column C - Services from domestic labor

Own monetary estimates based on CSO information on time spent on domestic labor for 1976, 1984, 1996, 2003. In 2005, for the first time, CSO published its own estimate of the value of domestic labor. Unfortunately, the method applied and results are very much different from the general assumptions adopted for the Polish study. A compromising solution has to be found.

Column D - Services from consumer durables

CSO supplies data on total consumer expenditures. Services from durables in the statistical household are estimated very arbitrarily. They are estimated, accordingly to the other available studies, at the level of 20% of estimated durables expenditures. This generalization needs statistical check.

Column E - Services from streets and highways

CSO statistics deal with investment on transport. Numbers for 1994-2003 were estimated based on available statistics on investment. Eventually, when available, direct values of services could be assessed and used instead.

Column F - Public health and education expenditures

CSO guarantee data on expenditures. Arbitrarily, after the authors of ISEW, only 50% of total expenditures contributes to welfare. The second half is just a defensive expenditure.

Column G - Consumer durables expenditures

CSO publishes data on total expenditures and some indices on the share of durables expenditures. For the entire period a 8.5% share has been assumed.

Column H - Defensive private expenditures on education and health

CSO supplies the data allowing for an assessment of total expenditures. A trouble remains the critical decision what is the percentage of them recognized as defensive and, therefore, deducted from the value of ISEW. Hitherto, a share of 50% has been adopted after the authors of ISEW.

Column I - Cost of commuting

Here own monetary estimates based on CSO information on time lost in commuting in 1976, 1984, 1996, 2003. Numbers for the entire period had to be interpolated. In addition, CSO shifted from net to gross presenting individual income used for cost estimates. This needs a careful adjustment.

Column J - Cost of automobile accidents

CSO supplies data on the registered costs of automobile accidents.

Column K - Cost of water pollution

Cost of water pollution was estimated based on previous studies on ISEW. They need critical analysis because coefficients of mean cost were used instead of marginal cost of pollution. Moreover, all estimates depend upon mean cost calculated per unit of pollution in the 90s.

Column L - Cost of air pollution

Similarly to water, cost of air pollution was estimated based on previous studies on ISEW. Coefficients of mean cost were used instead of marginal cost of pollution. In this case, mean cost per unit of pollution was calculated thanks to more fresh data collected in the late 90s.

Column M - Cost of noise pollution

For 1990-1998 estimates are based on public expenditures on protection against noise and vibration (CSO) while private expenditures are purely imputed. Then official statistics appeared to assess public and individuals' expenditures. Expenditures are assumed to assess, however imperfectly, the cost of noise pollution.

Column N - Loss of wetland

It was not and is not important in the Polish context. This category does not contribute to the value of ISEW.

Column O - Loss of farmland

Basic data from CSO were available – farmland area converted into non-agricultural use and prices of the land. However, since 2001 statistical yearbook on environmental protection has not published required information in the same format as before. As a result crude extrapolation for 2002-2003 was necessary because of time shortage.

Column P - Depletion of non-renewable resources

Methodology adopted after Austrian team. Monetary value of non-renewable resources depletion equals the annual net value added of the mining sector of the industry. Required data are available.

Column Q - Cost of long-term environmental damage

Emissions of CO_2 (CSO) are cumulated starting from 1990. The method of valuation uses the suggestion of the first authors. Total energy consumption was transformed to get the number of consumed oil barrels. Then, the rent coefficient per one barrel was used in the calculation (originally, USD 0.5 per one barrel of consumed oil, in 1972 pieces). However, it makes sense to think over modifications proposed by the critics of ISEW, e.g. Neumayer (1998). It would change the estimates

and interpretation of this column.

Column R - Cost of ozone layer depletion

Collected data on emitted freons (CSO, Ministry of the Environment) were multiplied by the rent assumed in previous international studies (originally, USD 15, in 1972 prices, per one kg of emitted freons).

Column S - Net capital growth

CSO data applied. The data elaboration has been based on the assumption that capital to contribute to the welfare must grow more than the labor itself. Capital growth was the most questionable category on the beginning of 90s when multiple revaluations of domestic capital caused a kind of chaos and limited comparability of old and new statistics.

Column T - Net change in international position

CSO supplies data on current balance of international trade and payments. They need revaluation because the idea is that any tendency towards net borrowing could be classified as unsustainable consumption. Also here we used methodology which was present in several previous studies.

Column U - Distributional inequality

As discussed already in the text, coefficients of growing income inequalities penalize the index. Unfortunately, the Gini index which we use for estimates was not available for 2001-2003. An inevitable extrapolation will be substituted in the near future by calculation based on a real index value.

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